



# The Math Forum's Problem Solving Process

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The problem solving process that the Math Forum has been developing since 1993, can be compared to the writing process. We encourage problem solvers to:

- read the problem
- get started
- carry out a strategy
- draft a solution and explanation
- reflect
- get feedback
- revise

This course aligns well with the Math Forum's Problems of the Week but could also be used to develop techniques to use with problem solving prompts in general. Participants are not required to have a Problem of the Week (PoW) Membership, although at the end of the course, they may find value in considering that as a logical next step as a resource for their students.

## **Goals**

We hope this course helps you:

- learn about the Math Forum's approach to problem solving as a process. Our goal is not to be over and done. Our goal is to think, reflect, revise, and master.
- learn about the resources provided with each of the Math Forum's Problems of the Week (PoWs) and how they can help you enhance student competence and confidence in problem solving and communication.
- develop concepts of mathematical problem solving and communication.
- enhance your understanding of NCTM's Process Standards and the role of PoWs in addressing them.
- learn about assessing student work and providing effective feedback in the context of the PoWs.

## **Course Requirements**

Participants enrolled in this course are only expected to have an Internet-accessible computer. There is no need to have any level of Problem of the Week membership. All problems and accompanying teacher resources will be available within the course environment and also in PDF format if the participant prefers to download any of the documents for printing.

### *Introduction:*

Participants will have some flexibility within each week but are expected to complete the activities during the assigned week. Participants who successfully complete the course activities will receive a Certificate of Completion from the Drexel University School of Education indicating they have completed 15 hours (1.5 CEUs) of Professional Development. For Pennsylvania residents we are also able to provide Act 48 credit.

### *Requirements:*

Most assignments can be completed anytime during the assigned week. Generally, the deadline for each week's assignments will be 10 pm (eastern time) on Wednesday nights. Occasionally some assignments will have a different deadline. Those will be noted in the weekly overview.

Contributions to the discussions should be thoughtful and add something of value to the topic.

Our approach is to

1. value everyone's contributions as we all share our explorations and wonderings.
2. ask and answer questions of ourselves and others.
3. think of how this can transfer to our classrooms.

Participants are welcome to request an online chat with the instructor and/or arrange a chat time to have with other participants.

### **Weekly Schedule**

**Week 1:** Understanding the Problem

#### Focus:

*Problem solving as a vehicle for teaching and learning mathematics.*

#### Objectives:

- Become oriented to the Epsilon course tool environment (only an Internet connection and Web browser are required).
- Introduce yourself and become acquainted with the other course participants.
- Individually solve a Problem of the Week (PoW).
- Post your answer and explanation in the Epsilon environment.
- Increase understanding of what good problem solvers do.

**Week 2:** Communication

#### Focus:

*The nature of good communication in problem solving and the teacher's role in facilitating it.*

#### Objectives:

- After discussion and feedback from the instructor, revise your PoW journal post.
- Increase understanding of good communication in problem solving.
- Practice thinking in terms of "I notice..." and "I wonder..." to encourage reflection and revision.

**Week 3:** Representation

#### Focus:

*Representations (physical objects, drawings, charts, graphs, and symbols) help students communicate their thinking.*

#### Objectives :

- View and discuss the *Enhanced Problem Packet for Teachers*
- Examine samples of student work.
- Examine suggestions of how to facilitate students' reflection and revision of their work.
- Discuss the different representations students might use.

#### **Week 4: Reasoning and Proof**

##### Focus:

*Communication is key to understanding each student's reasoning.*

##### Objectives:

- Reflect on and discuss the role of reasoning at your grade level.
- Explore ways to develop student's ability to justify their thinking.
- Continue to think in terms of "I notice" and "I wonder."
- View and discuss the *Problem Solving and Communication Activity Series*
- Reflect on and discuss how problem solving is or could be implemented in the classroom.

#### **Week 5: Connections and Reflections**

##### Focus:

*The mathematical ideas presented in our mathematics classes should interconnect and build on one another to produce a coherent whole.*

##### Objectives:

- Individually solve another Problem of the Week (PoW). [Optional: print copies of one of the problems offered in PDF format and present to students in your classroom. Post one of their solutions instead of your own.]
- Post your answer and explanation (or a student's) in the Epsilon environment.
- View and discuss the *Enhanced Problem Packet for Teachers*.
- View and discuss the *Problem Solving and Communication Activity Series*.
- After discussion and feedback from the instructor, revise your PoW journal post.

#### **Week 6: Set up a Trial Account/Next steps**

##### Focus:

*Become aware of the Problem of the Week resources that are available.*

##### Objectives:

- Visit all of the different Problem of the Week resources, including
  - CurrentProblems
  - ProblemsLibrary
  - WriteMath
  - Technology Problems of the Week (tPoWs) -- freely accessible
- Have the opportunity to ask questions about the PoW and tPoW services and resources.
- Discuss strategies for managing problem solving in your classroom.

#### **Readings**

Title: *Principles and Standards for School Mathematics*

Author: National Council of Teachers of Mathematics (NCTM)

Edition/Year: 2000

If you are not an NCTM member and do not have access to the print form of this document, you can sign up for 120-day free online access to the full Principles and Standards at NCTM's website. This document will be used throughout the course.

Title: *Problem Solving and Communication Activity Series: Program Description & Introduction*

Author: The Math Forum

PDFs of these are linked from the weekly readings assignment pages.

Title: *Problem Solving and Communication Activity Series*

Author: The Math Forum

PDFs of these are linked from the weekly readings assignment pages.

Title: *Enhanced Problem Packet for Teachers*

Author: The Math Forum

PDFs of these are linked from the weekly readings assignment pages.

### **Recommended Resources**

Title: *Dr. Math® Gets You Ready for Algebra*

Author: The Math Forum

Publisher: John Wiley & Sons

The book is a series of questions and answers arranged according to a standard math pre-algebra class, and supplemented with Internet references and a glossary.

Available here: <http://mathforum.org/pubs/dr.mathbooks.html>

Title: *Dr. Math® Explains Algebra*

Author: The Math Forum

Publisher: John Wiley & Sons

The book is a series of questions and answers arranged according to a standard Algebra I class, and supplemented with Internet references and a glossary.

Available here: <http://mathforum.org/pubs/dr.mathbooks.html>